

Biogeochemical Factors Influencing Phosphorus Retention in the Everglades Stormwater Treatment Areas

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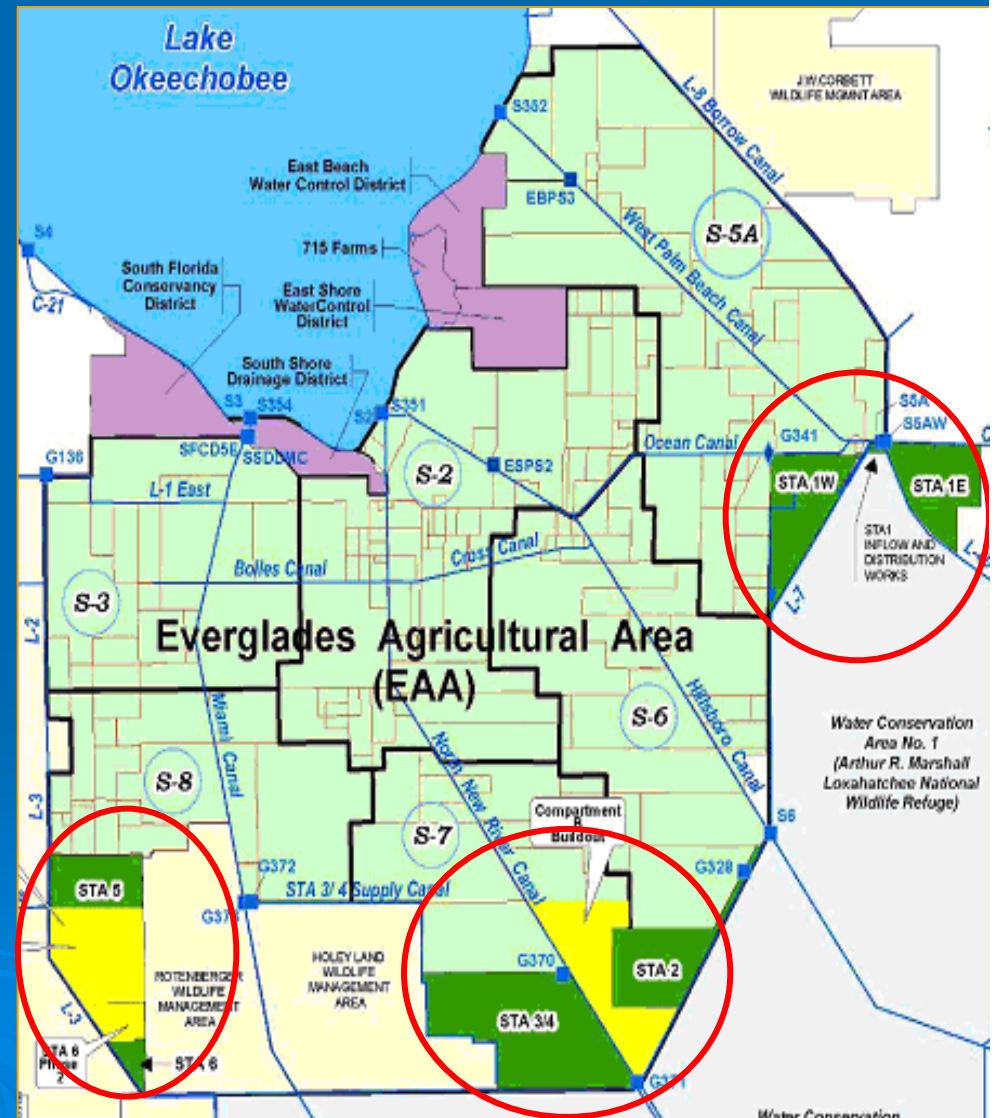
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July 29, 2008

Overview of the STAs

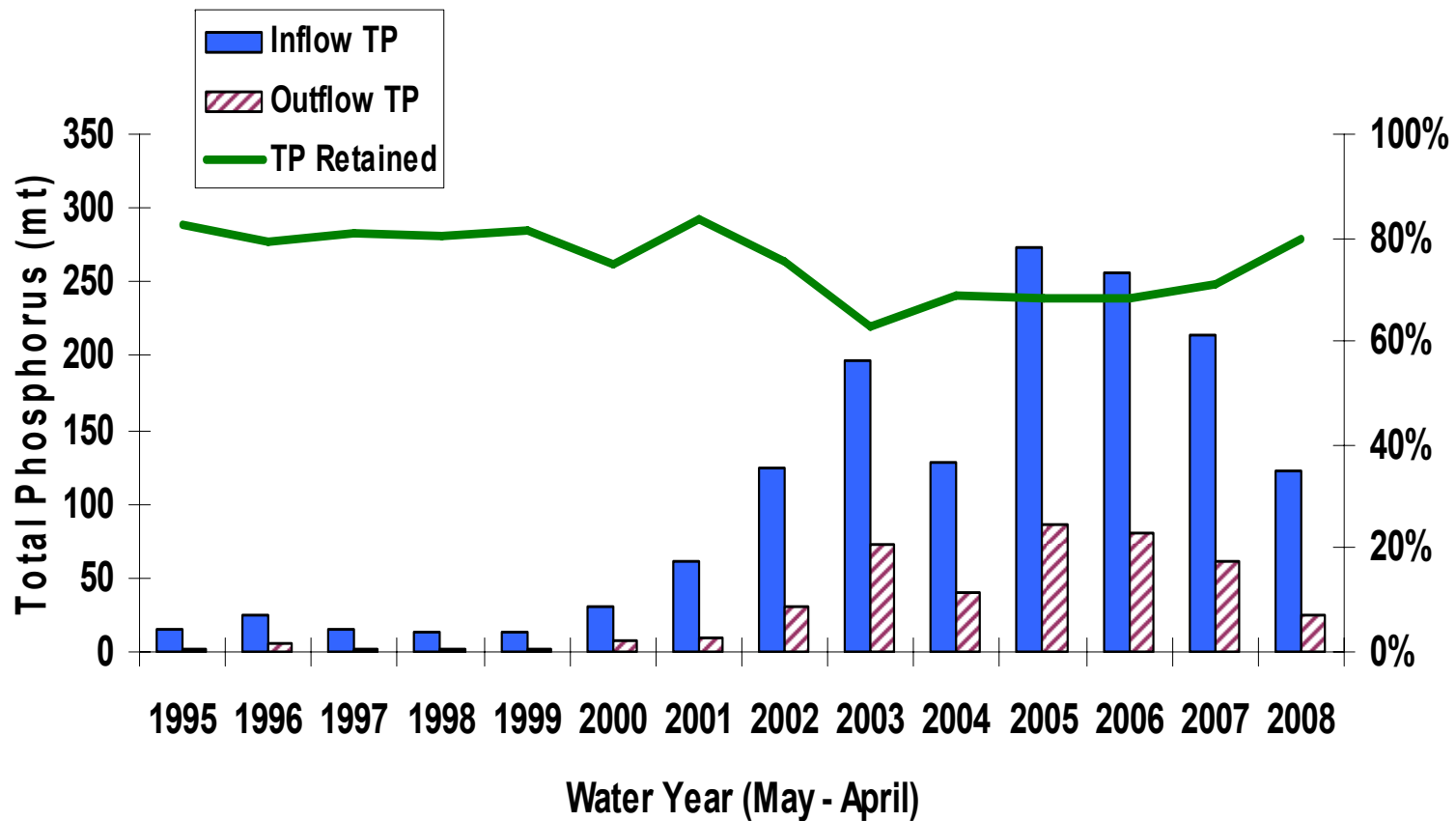
STA	First Year of Operation	Treatment Area (Acres)
1 E	2004	5,132
1 W	Eastern and Western FW: 1994; Northern FW: 2000	6,670
2	Cells 1-3: 2000; Cell 4: 2007	Cells 1-3 (6,338) + Cell 4 (1,902) =8,240
3/4	2004	16,543
5	Northern & Central FW:1999; Southern FW: not yet operational	Northern & Central FW:4110; Southern: 1,985
6	Section 1: 1998; Section 2: 2007	Sect. 1: 870; Sect. 2: 1,387

44,937 acres

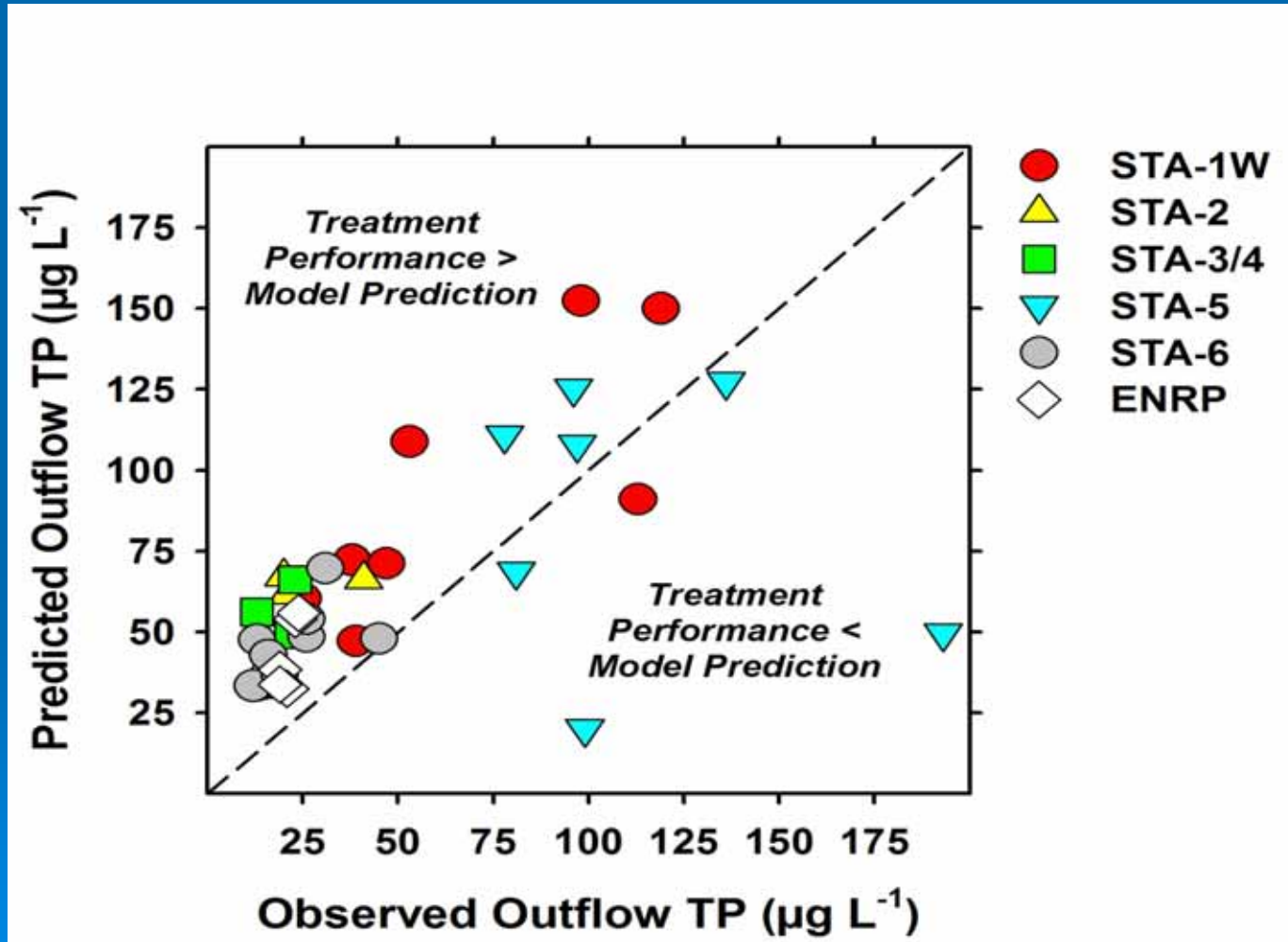


Historical STA Performance

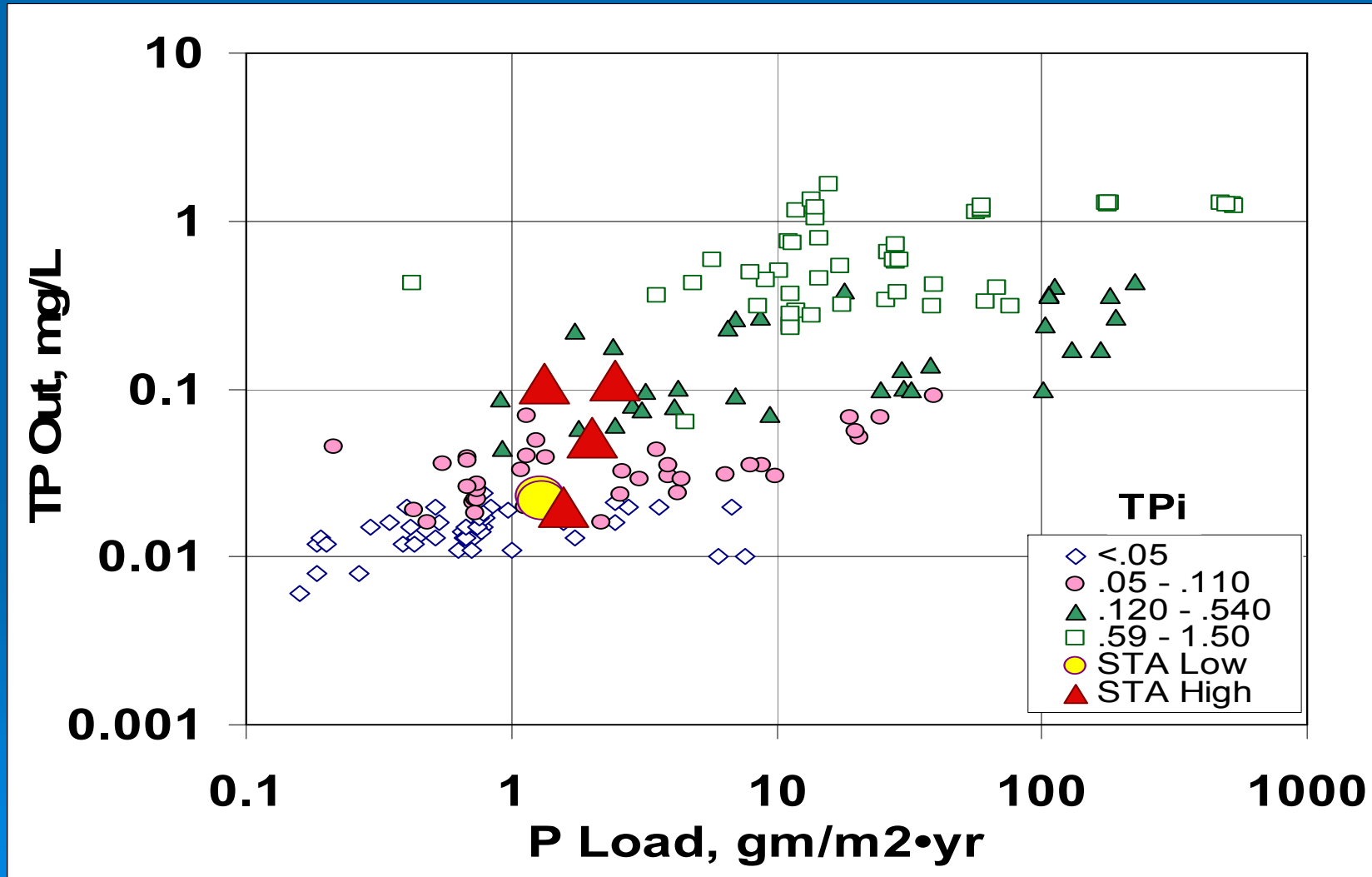
Everglades STA Phosphorus Load Reduction



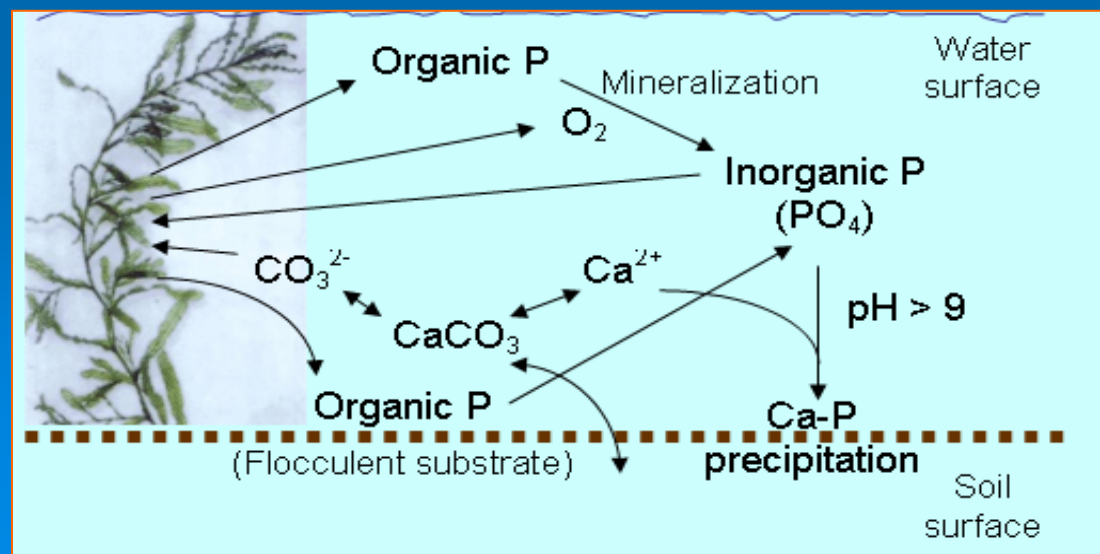
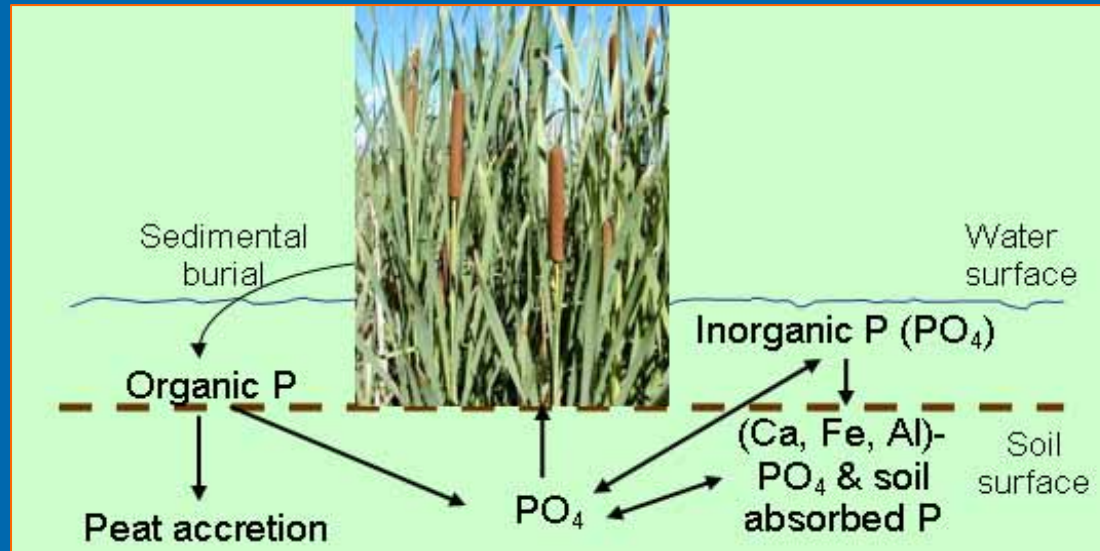
STA Actual Performance vs. Model Prediction



EAA STA Performance Compared with Other Treatment Wetlands



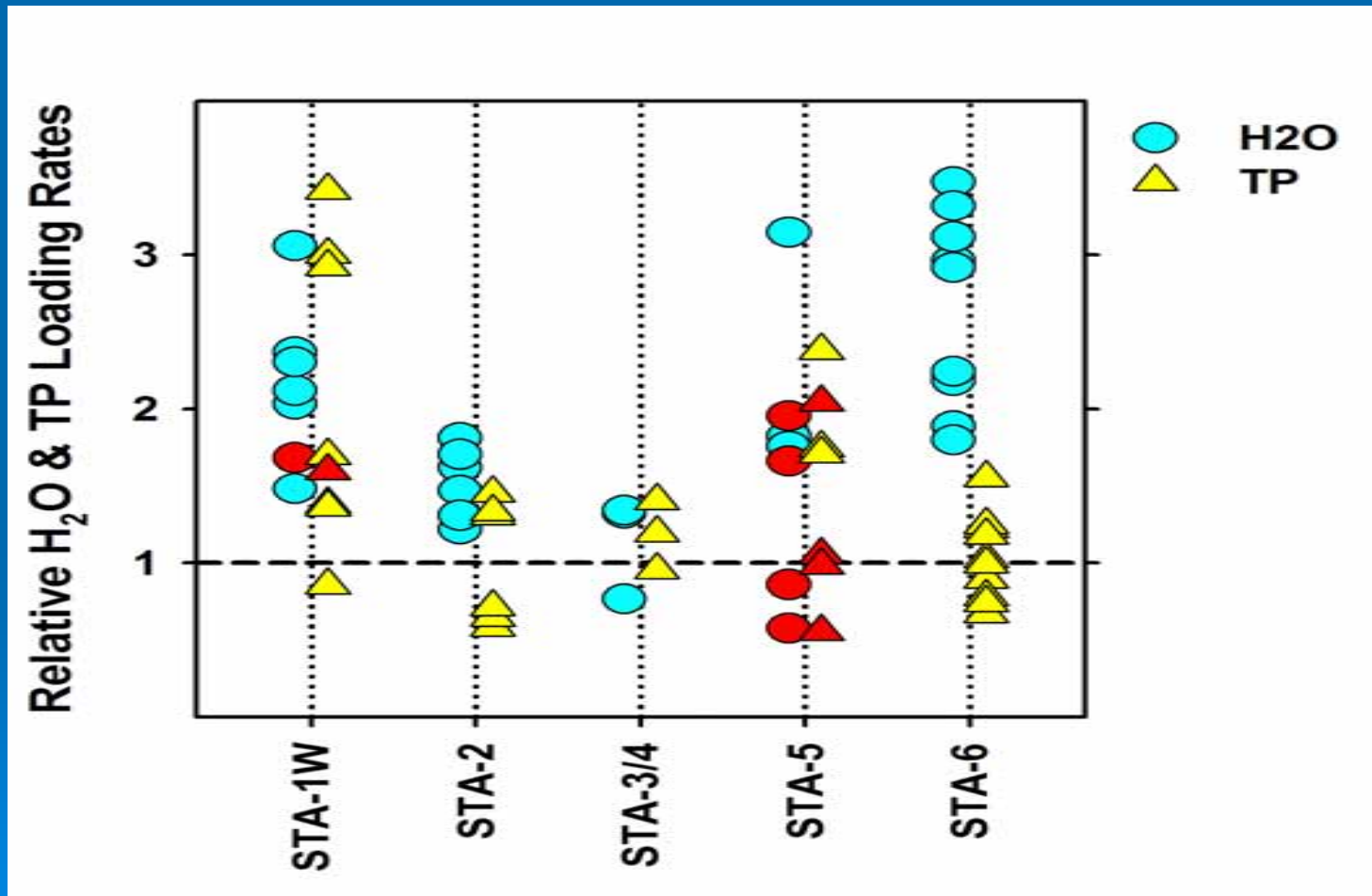
Phosphorus Cycling in EAV and SAV Treatment cells



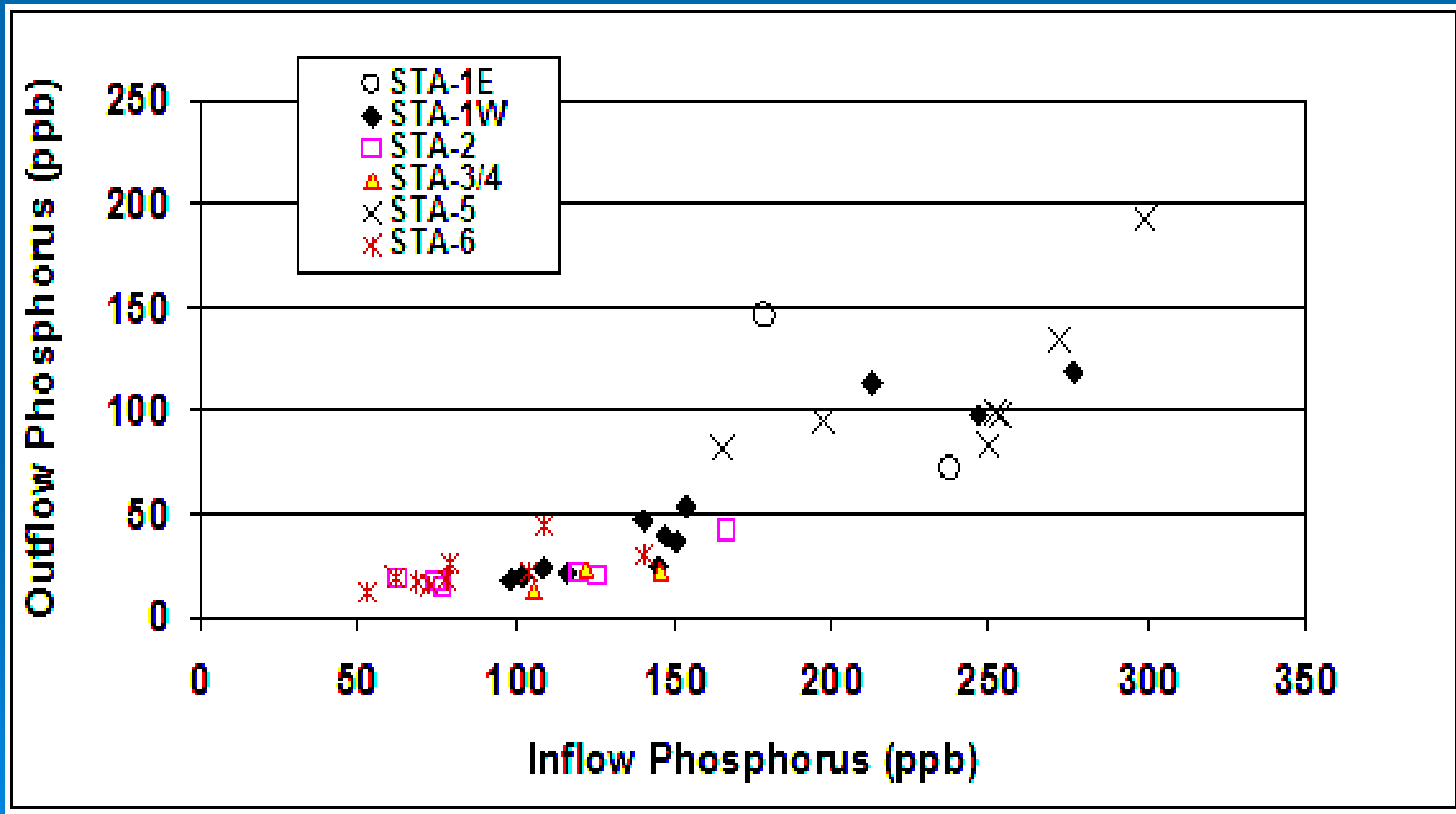
Factors Influencing Abiotic Phosphorus Retention

- pH
- Redox potential
- Calcium, iron, and aluminum concentration
- Organic matter content
- Phosphorus loading
- Soil P content

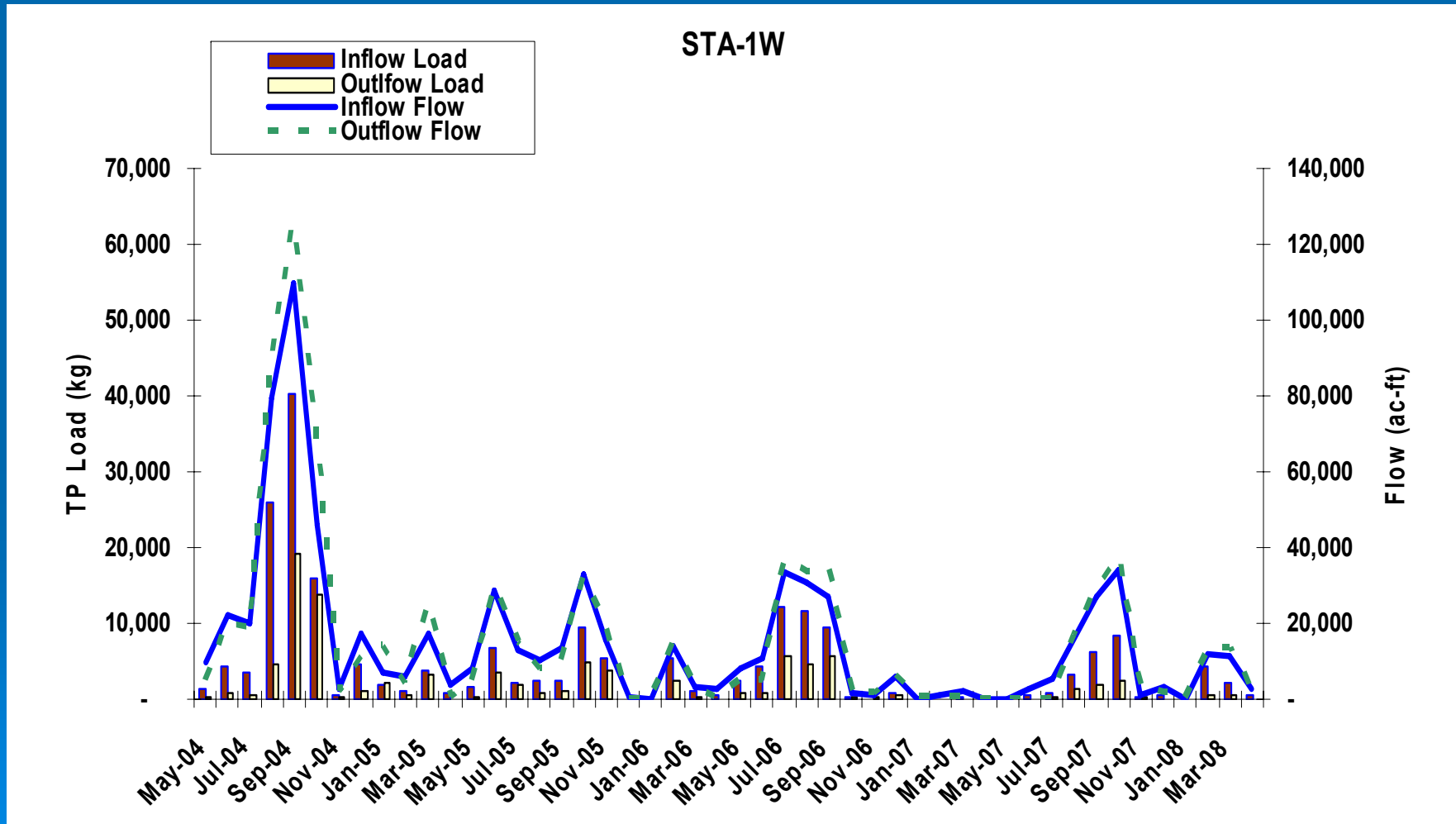
Hydraulic and Nutrient Loading



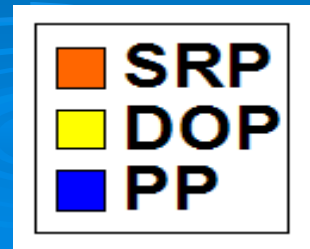
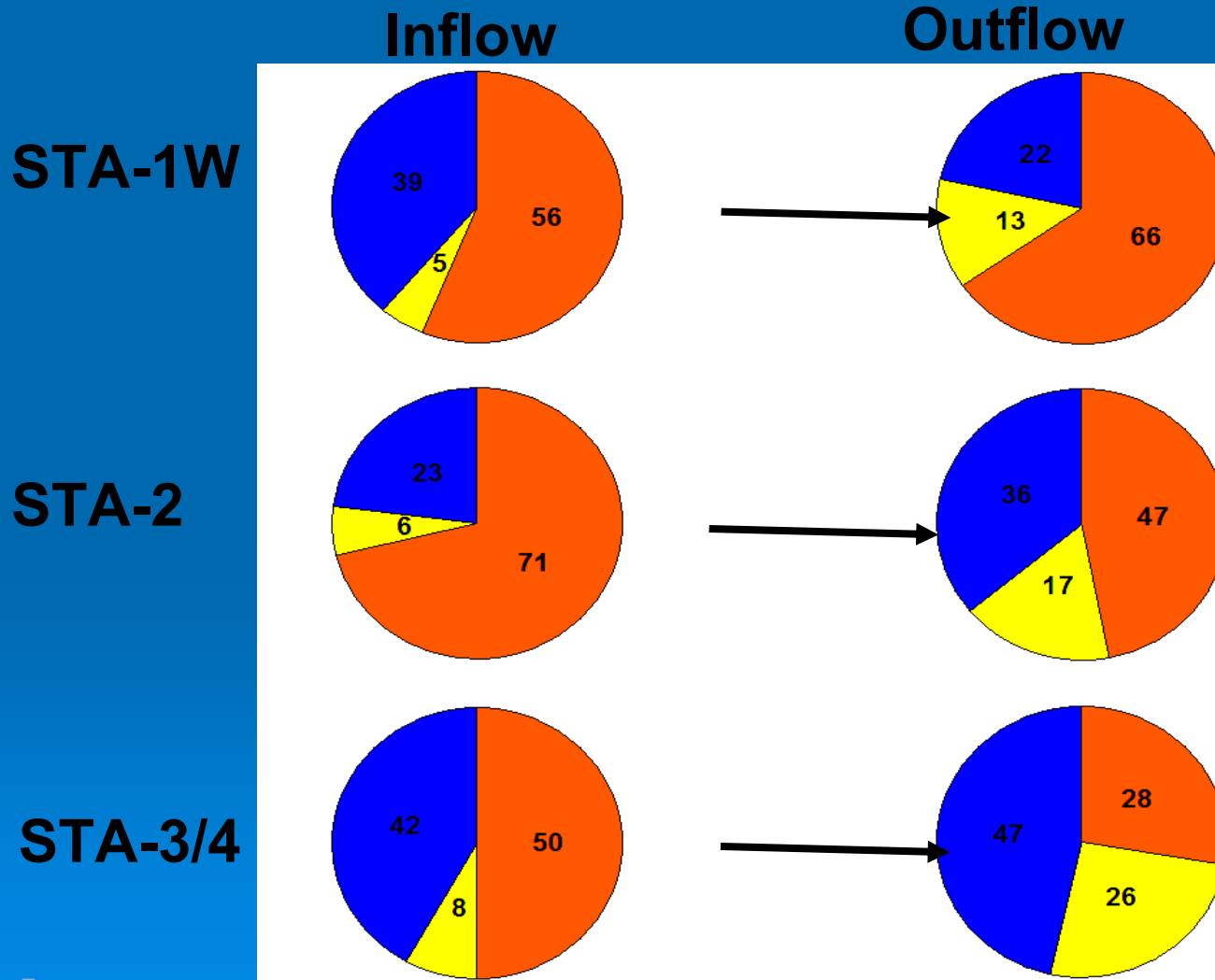
Effects of STA Inflow Concentration



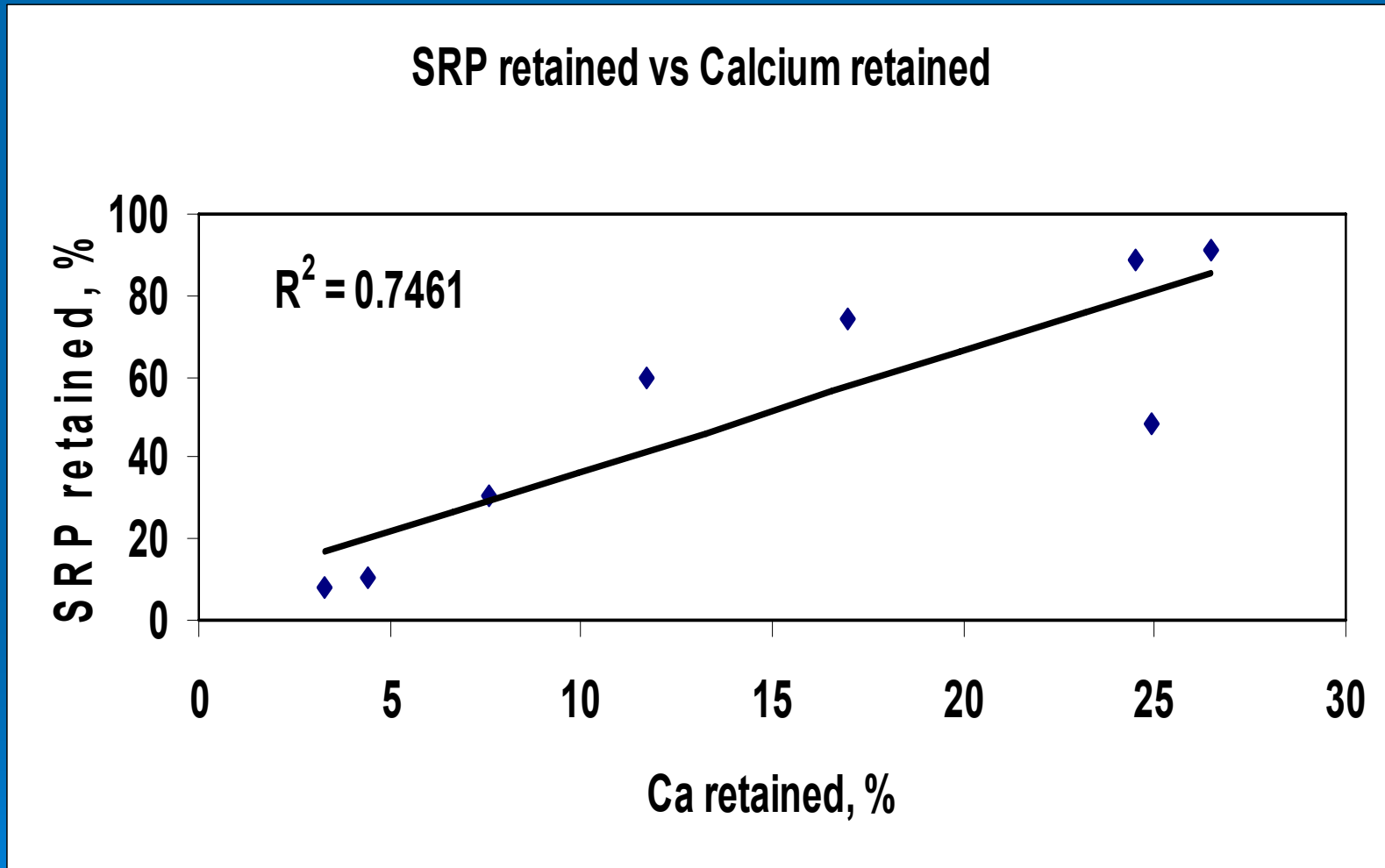
Effects of Hydraulic and Nutrient Loading, STA-1W



Changes in Surface Water Phosphorus Fractions (% of Total P Mass)



SRP retained vs Calcium retained

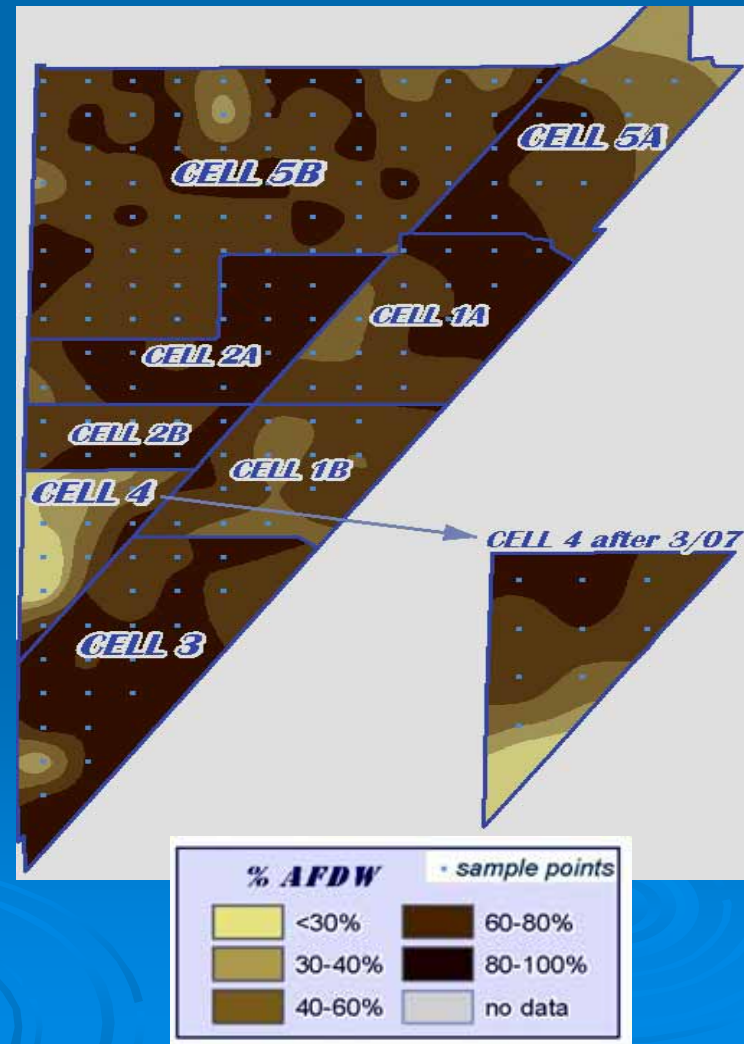
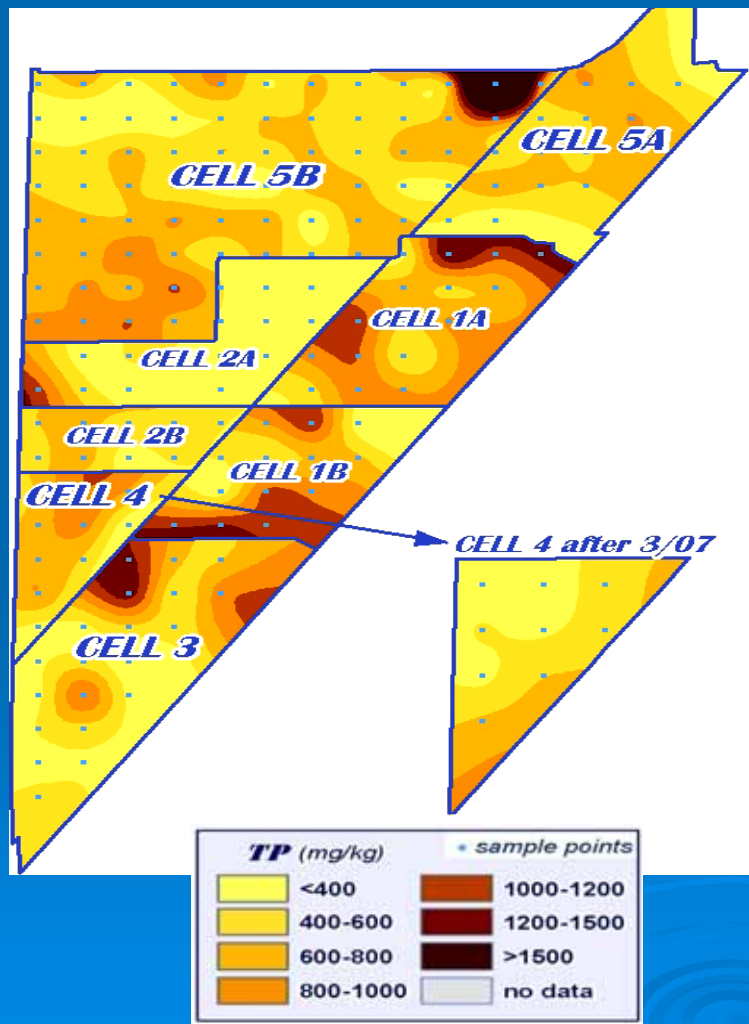


*Period of record total retention for selected cells in STA-1W, 2, and 5

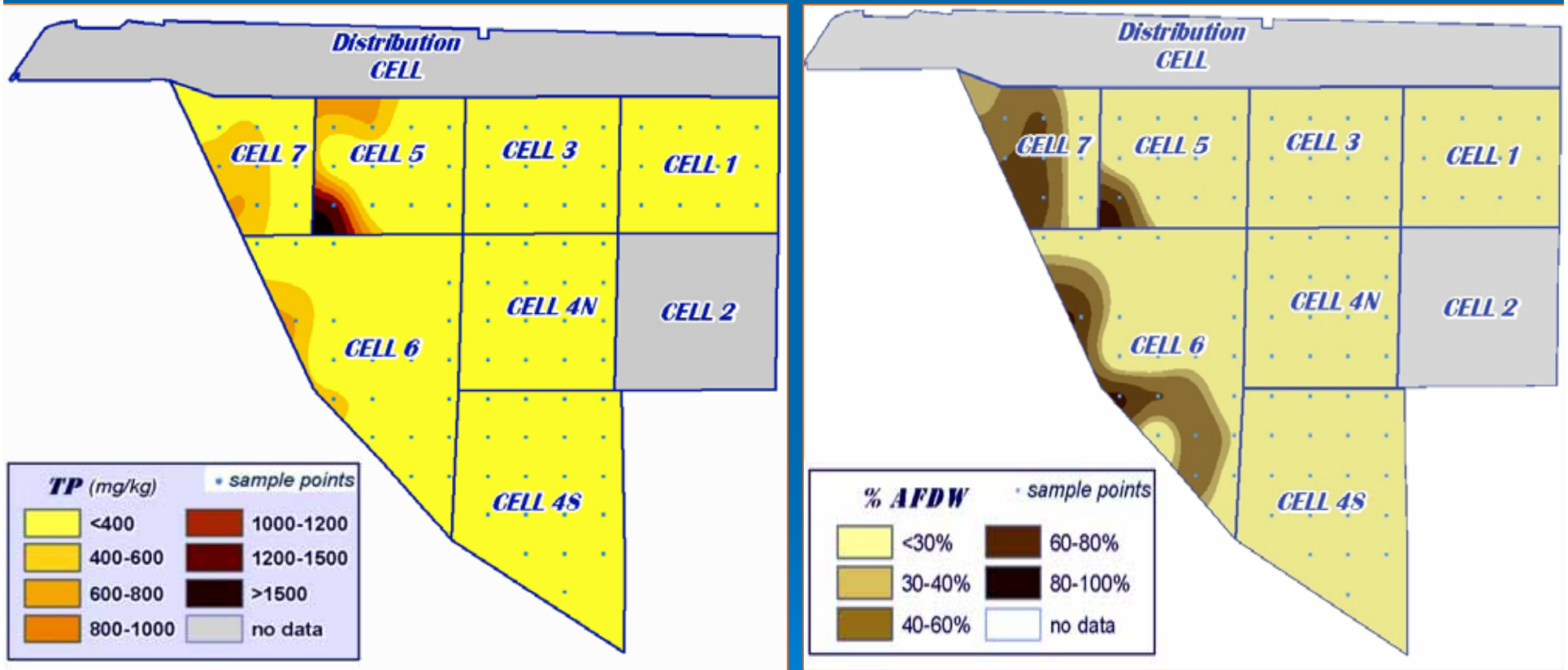
Total Phosphorus Retained in STA-1W Floc and Accrued Soil

- After 10 years of operation: 162 mt TP (68% of TP retained)
- After approx. <2 yrs of operation, Cell 5B: 13 mt (14% of TP load into the cell)
- Soil (0-10 cm): 215 mt (64% of TP retained)
- In 2007, 370,000 cu yds of accrued soil with approximately 19 mt of TP removed

Soil TP and Organic Matter Content STA-1W, 12 Yrs of Operation



Soil TP and Organic Matter Content STA-1 East, 2 Yrs. of Operation



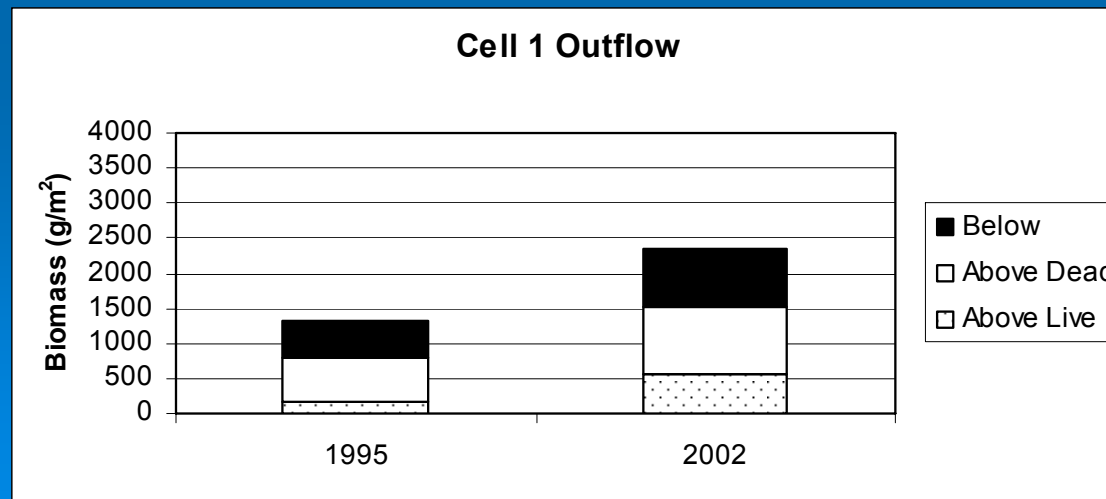
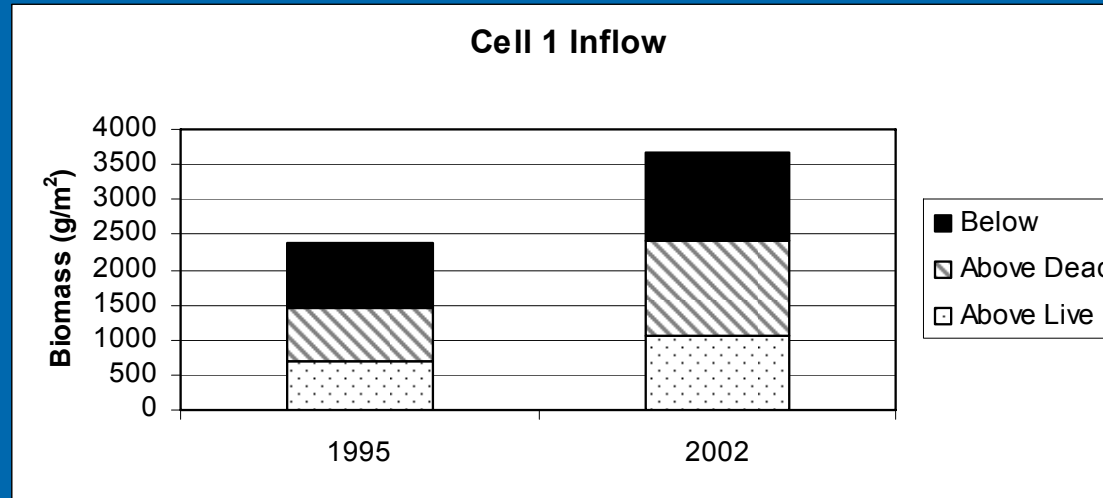
Upper 10 cm; no floc layer present

Phosphorus Removal via Vegetation Uptake

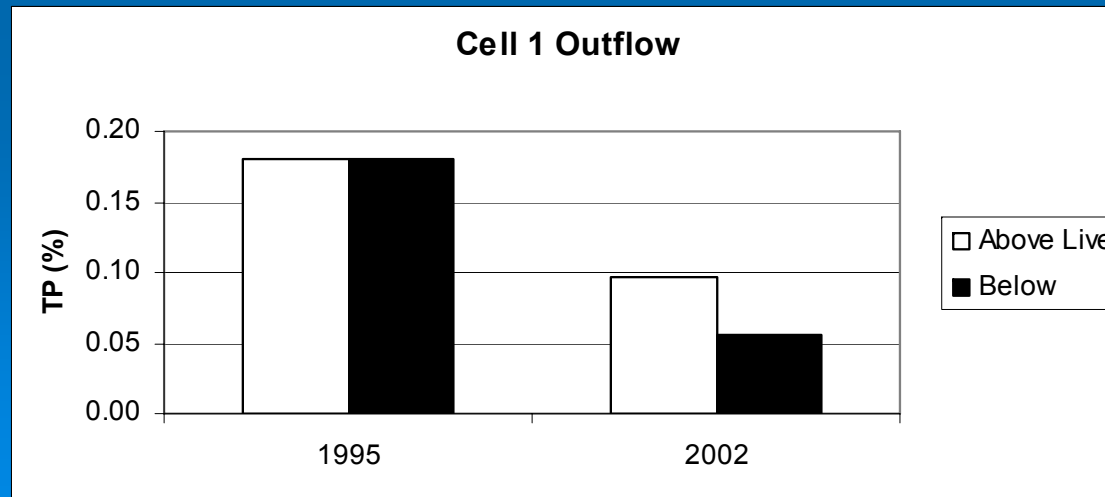
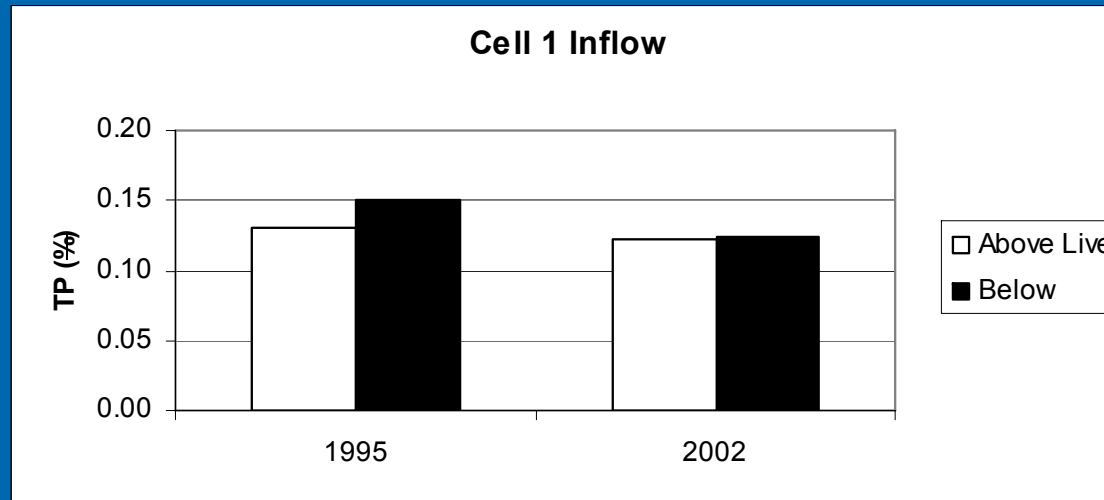


- Type of vegetation community
 - Emergent vegetation
 - Submerged aquatic vegetation
 - Periphyton
- Vegetation condition and sustainability
 - Water depth
 - Adverse weather condition such as drought and storms

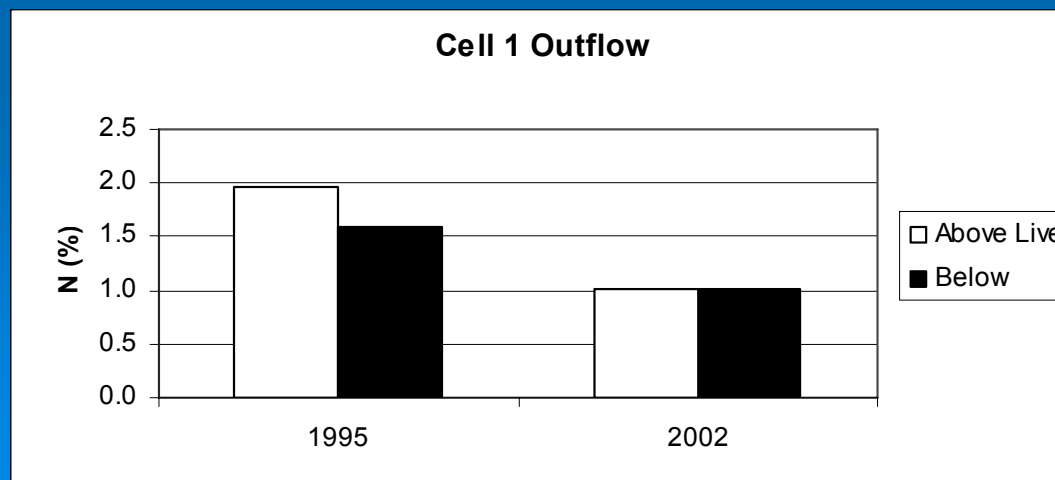
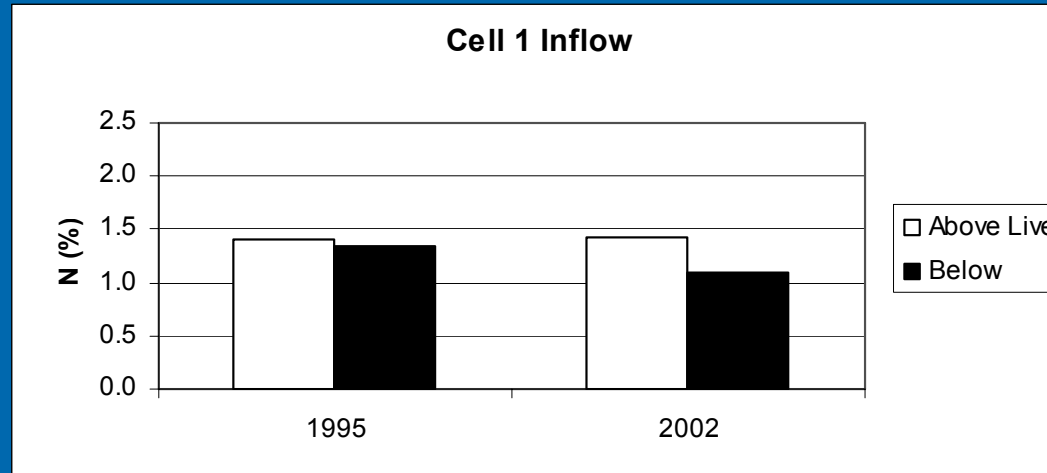
Typha Biomass, STA-1W Cell 1



Typha Tissue Phosphorus Content, STA-1W Cell 1



Typha Tissue Nitrogen Content, STA-1W Cell 1



Summary

- Over 45,000 acres of treatment
- Approximately 1 thousand metric tons of phosphorus have been removed
- Except for STA-5, actual performance generally exceeds model prediction
- STA performance is influenced by various factors including:
 - Inflow concentration
 - Hydraulic and TP loading
 - Soil biogeochemical condition
 - Vegetation type and condition
- STAs are managed wetlands, i.e. have to be continuously monitored and strategically managed to optimize performance and ensure sustainability.

Questions?

